

# Noise Basics

## Introduction

You have probably heard that loud noise can cause deafness. Various media articles tell us about teenagers losing their hearing at ear-splitting rock concerts, soldiers developing hearing loss from artillery fire, and people going deaf after an explosion. It also happens on the job when workers are exposed to less intense but sustained noise over time. Construction workers seem especially affected because they often work around noisy vehicles and power equipment.

This outline on noise will answer the following questions:

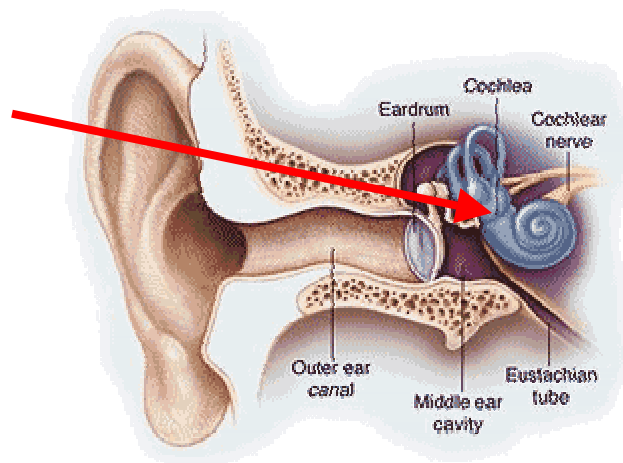
- What does noise do to our ears?
- How much noise is too much?
- How is noise measured?
- How is hearing loss measured?
- How can people protect their hearing?
- What workplace safety rules apply to noise?
- How can loud machinery and other noise sources be quieted?



## What does noise do to our ears?

Our ears are amazing! We can hear a wide range of pitches from the squeak of a mouse to the low roar of a waterfall. We can hear over a loudness range from a pin dropping to the same roaring waterfall or a jet engine. But our ears do have their limits. Excessive noise can cause damage to the nerves in the inner ear. Our ears can recover from a short exposure to loud noise, but being around too much noise over an extended period of time will eventually cause nerve damage and hearing loss. The louder the noise and longer the exposure, the greater chance permanent damage will occur. A really loud noise, such as a gunshot, can cause immediate hearing loss, but that doesn't happen too often on the job. Continued exposure to workplace noise over a number of years often leads to gradual, but permanent hearing loss.

Damage and hearing loss occurs in the cochlea of the inner ear



### **How much noise is too much?**

Noise is measured in units called “decibels”, abbreviated as “dB”. Noise levels can range from 1 dB (near silence) to 60 dB (quiet conversation) to 140 dB (a jet engine).

Scientific studies have shown that people exposed to noise levels of 85 decibels and above over 8 hours or longer will gradually lose their hearing over time. If you have to shout to be heard by another person 3 feet from you, the noise level is probably above 85 decibels. Remember, the louder the noise level and the longer the exposure, the greater the risk of hearing loss. Noise levels above 140 decibels will cause immediate hearing loss. But everyone should wear hearing protection all the time when working around noise levels above 115 decibels. Here are some noise levels of commonly used equipment:

| <u>Equipment</u> | <u>Noise Level</u> |
|------------------|--------------------|
| Back Hoe         | 85-95 decibels     |
| Chain Saw        | 110 decibels       |
| Front-end Loader | 90-95 decibels     |
| Gunshot          | 140 decibels       |
| Jackhammer       | 112 decibels       |
| Lawn Mower       | 90 decibels        |
| Tractor          | 95-105 decibels    |
| Circular Saw     | 90-100 decibels    |



### **How is noise measured?**

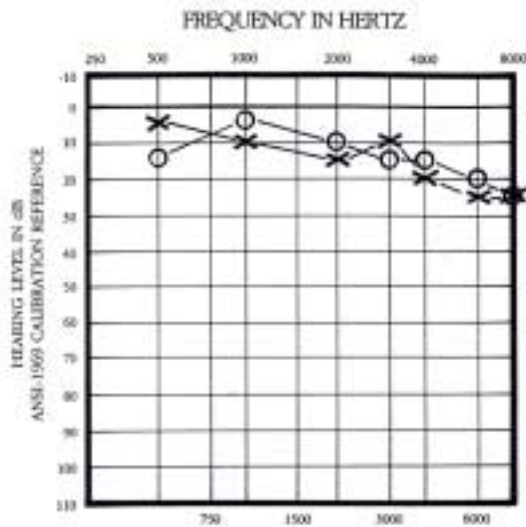
Noise is measured with a sound level meter. These instruments measure noise in decibels. An inexpensive sound level meter can be purchased at an electronics store for as little as \$60 and is suitable for measuring most workplace noise. More advanced and accurate sound level meters cost \$300 or more. Below is an example of a sound level meter.



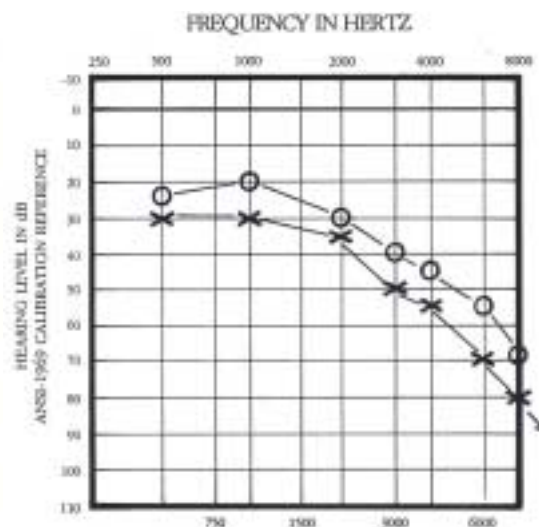
A sound level meter measures noise levels at a particular moment. There are also more sophisticated instruments that can measure average noise levels over a whole day.

### **How is hearing loss measured?**

You may have been to a doctor or clinic where your hearing was tested by listening to different tones through headphones. These hearing tests are also called “audiometric testing” or “audiometric exams.” Audiometric testing checks how well you hear various sound pitches or frequencies and if there is a drop in your ability to hear these pitches over time. Most people naturally show a slight decrease in the ability to hear high-pitched sound as they get older. But people exposed to too much noise will typically show a great decrease in this ability. People with hearing loss caused by noise often say they can hear someone talking but can’t understand them. This is because human speech contains high-pitched sound in letters like *s* and *t*. Below are examples of “audiograms” which are the results of hearing test measurements recorded on paper.



**Normal hearing**



**Hearing loss from noise exposure**

*The higher pitches or frequencies (above 1000 hertz) are on the right in each of these audiograms. The “x” is the right ear and the “o” is the left ear.*

### **How can people protect their hearing?**

The most obvious way to protect your hearing is to avoid loud noise whenever possible. At the workplace, reducing or eliminating the source of the noise is the best way. Obviously on some jobs that is impossible and earplugs or earmuffs must be worn.



**Foam earplugs**




**Ear muffs**

However, earplugs and earmuffs are not always comfortable. Many people are also concerned that they won't be able to hear warning alarms or moving vehicles at their workplace or that they will interfere with communication with others. So it is better to try to quiet the noise level of noisy machinery or power equipment first. In fact, safety and health regulations require that employers take these measures if the 8-hour average noise levels are above 90 decibels.

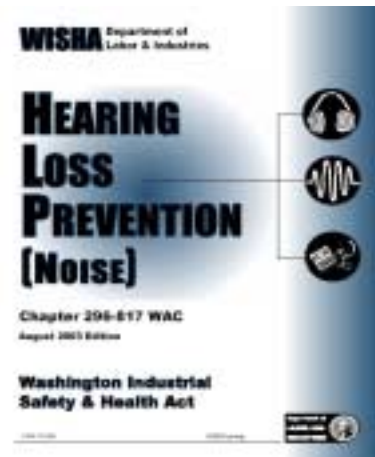
### **What workplace safety rules apply to noise?**

The Department of Labor & Industries - WISHA division, has a rule that requires protecting workers from noise exposure at work. This rule is called "Hearing Loss Prevention (Noise)". It has six basic requirements that employers are supposed to follow whenever their workers are exposed to noise. They are as follows:

1. Conduct employee noise monitoring,
2. Reduce noise levels with feasible controls if employees' 8-hour average noise level exceeds 90 decibels,
3. Make sure employees wear hearing protection when exposed to 8-hour average noise levels of 85 decibels or greater,
4. Train employees about the effects of noise and use of hearing protection,
5. Periodically check employee's hearing with audiometric testing,
6. Post warning signs at high noise areas above 115 decibels.

To view the noise rule click on this picture, 

or go to: <http://www.lni.wa.gov/wisha/rules/noise/>



### **How can noise levels of loud machines and equipment be reduced?**

Depending on the source, noise can be reduced in several ways. They are as follows:

1. Buying quiet machinery and equipment
2. Maintaining machinery and equipment routinely
3. Reducing machinery and equipment vibration
4. Muffling engine and compressed air noise
5. Isolating the noise source in an insulated room or enclosure
6. Placing a barrier between the noise source and the employee
7. Isolating the employee from the source in an insulated booth or room.

### Buying quiet machinery and equipment

Many manufacturers of power equipment and vehicles have made significant reductions in the noise output of their products in recent years. Sometimes these noise controls are options and are not well advertised. Some manufacturers have also developed noise-reducing retrofits for their older products. Examples of built-in noise controls include insulated cabs on trucks, tractors and other construction vehicles, and insulated generators.



An insulated truck cab

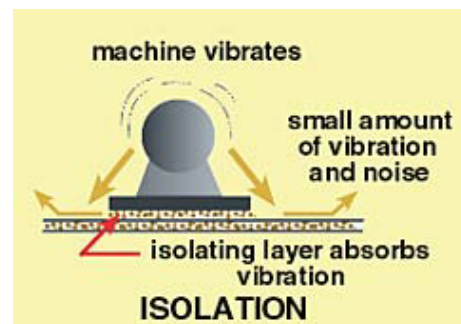
### Routine machinery and equipment maintenance

Existing equipment and machinery will often become noisier over time if you neglect routine maintenance. Tightening nuts and bolts, adjusting engines, and oiling or greasing moving parts can reduce noise levels, sometimes dramatically.



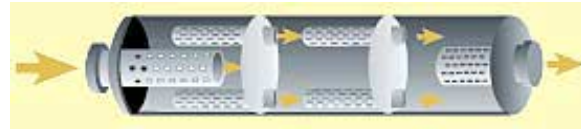
### Reducing machinery and equipment vibration

Vibrating parts on machinery and equipment are a common noise source. Vibration can be controlled by mounting the machinery on special rubber pads or springs, or with noise-damping rubber joints between parts within the machinery. Vibration damping material can also be attached or sprayed on flat vibrating surfaces to reduce noise.



### Muffling engine and compressed air noise

Using mufflers on engines is a well-known method of reducing noise. Sometimes they are an option and have to be specifically ordered. Special silencers are also available for compressed air equipment and fans.



Inside of a muffler

### Isolating the noise source in an enclosure

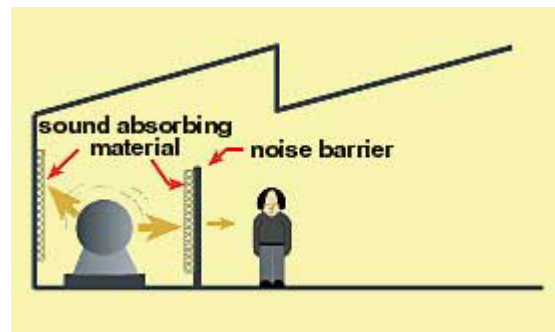
A noise source that stays in one place can be enclosed in an insulated box, booth or room. Noisy generators and wood planers are often controlled in this way. The enclosure usually has two layers – an outer layer made of heavy stiff material like wood, metal, or concrete and an inner noise-absorbing foam layer.



An enclosed generator

### Barrier between noise source and employees

Some noise sources must be easy to access and cannot be fully enclosed. A flat barrier between the noise source and employees will give a small reduction in noise level. A partial enclosure will be somewhat more effective. Placing absorbing material on nearby reflective walls or ceilings also can help reduce noise levels.



### Isolating the employee in an insulated booth or room

In some cases, employees can be isolated from noisy machinery they operate by placing them in a quiet booth or control room. This usually requires windows and sometimes the ability to operate equipment with remote controls. An office enclosure on a noisy factory floor is another example.



Enclosed factory floor office